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Hapgood et al.

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[54] **INCINERATOR WALL AND DOOR STRUCTURE**

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[73] Assignee: **Raytheon Company,** Lexington, Mass.

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[52] **U.S. Cl.** ..... **110/18 R;** 110/173 R

[51] **Int. Cl.²** **F23G 5/00;** F23M 7/00

[58] **Field of Search** ..... 110/8 R, 8 C, 18 R, 18 C, 110/173; 126/190, 21 R

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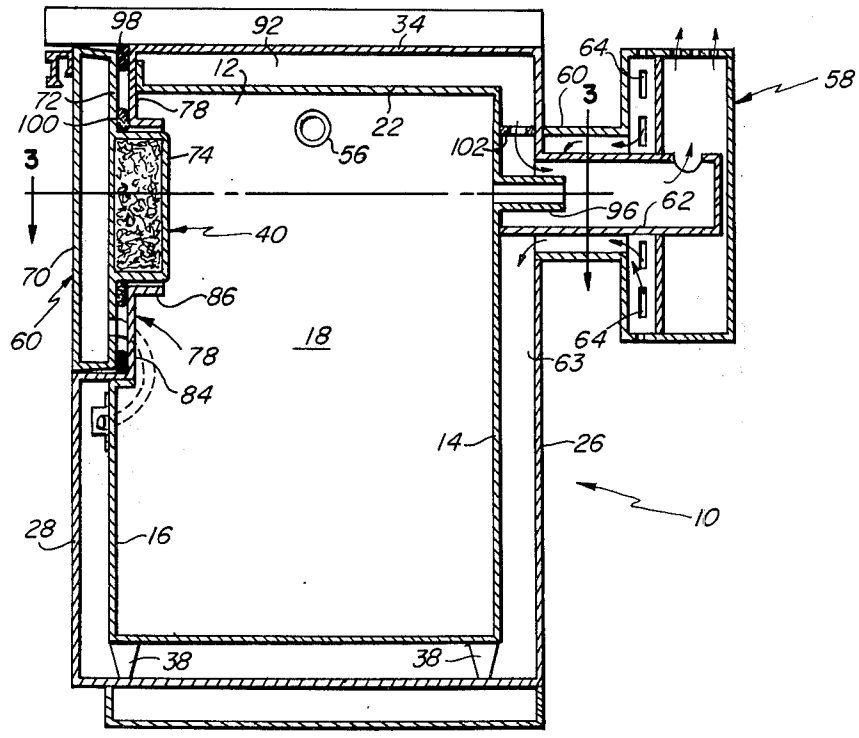
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[57] **ABSTRACT**

An incinerator having air-cooled walls and door construction surround a burning compartment in which circulation of combustion air and generated gases is provided at a known pressure, the door having inner and outer circumferential seals with the encircling portion of the wall, and means for circulating air through the interior of the walls and of the door at a pressure slightly higher than the pressure within the burning compartment to prevent smoke leakage around the door.

8 Claims, 5 Drawing Figures



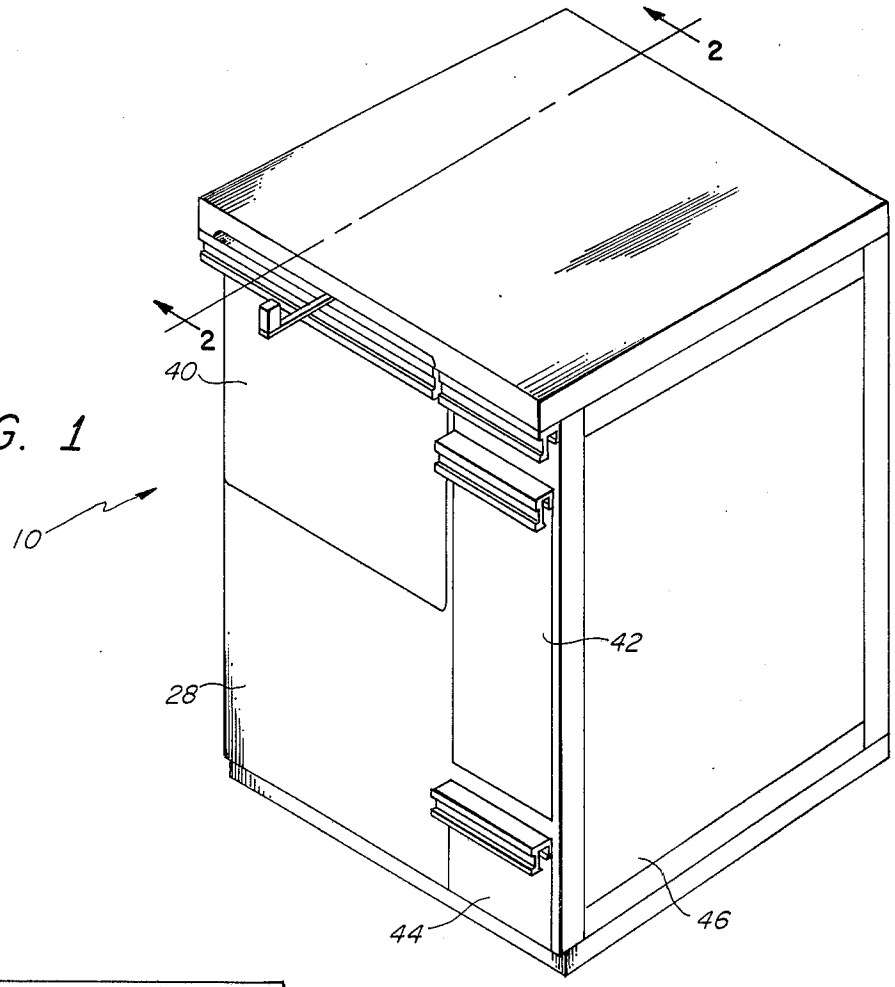

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FIG. 1

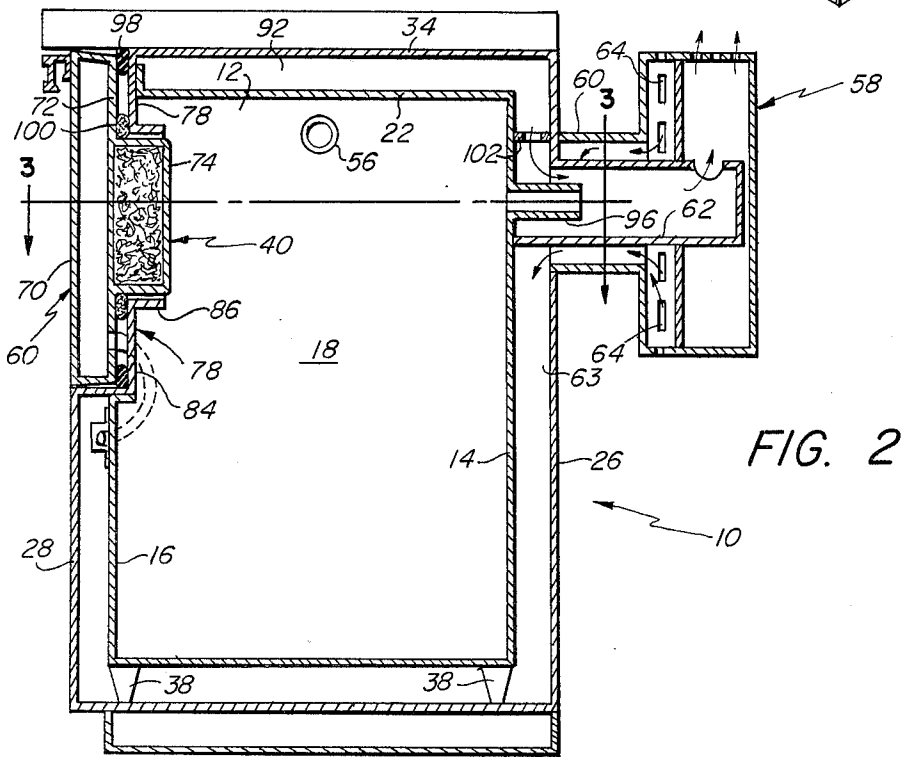

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FIG. 2

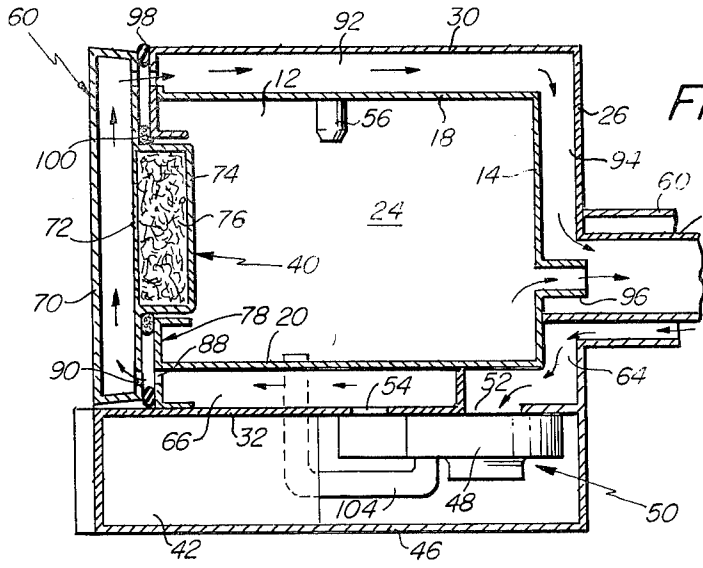


FIG. 3

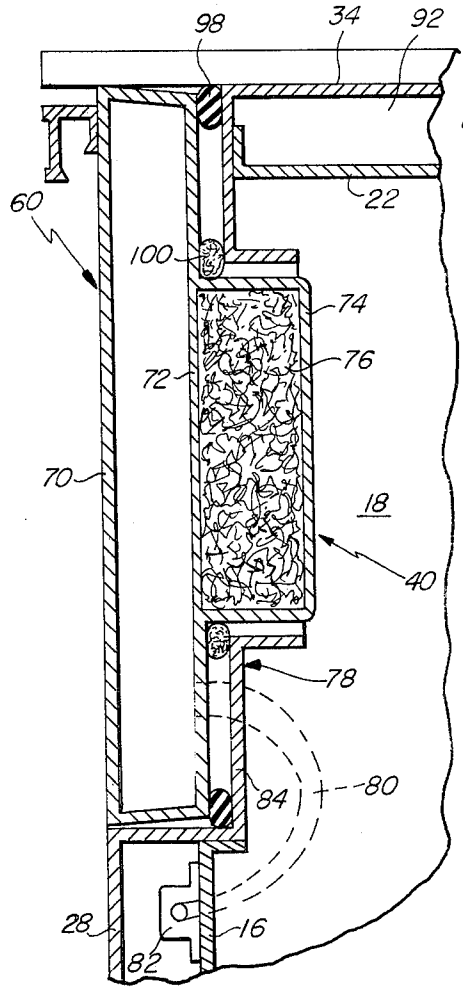


FIG. 4

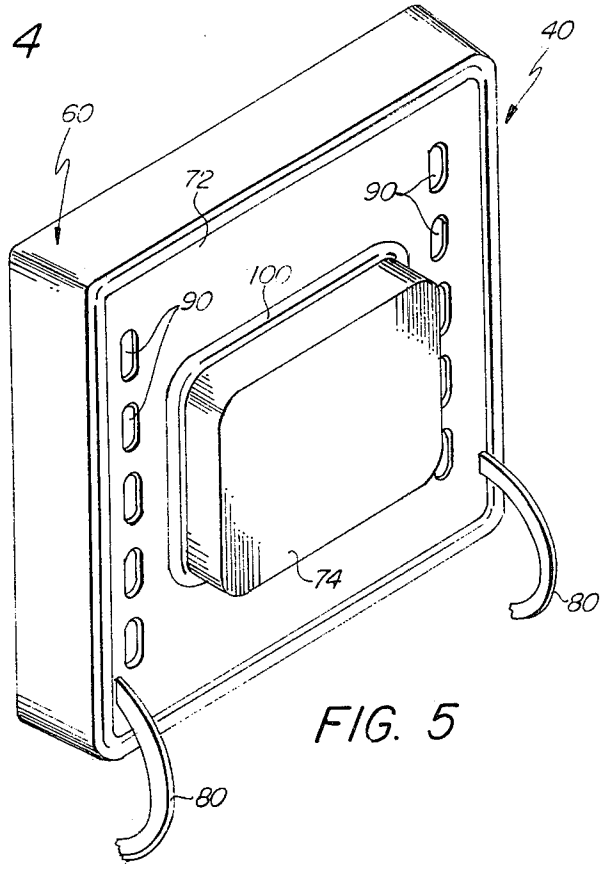


FIG. 5

INCINERATOR WALL AND DOOR STRUCTURE

BACKGROUND OF THE INVENTION

In the manufacture of burning appliances such as incinerators, for example, it is of primary importance that precautions be taken to prevent escape of smoke into the ambient atmosphere. This is particularly true of incinerators which are used in confining spaces such as household incinerators used in a kitchen or other room, or other incinerators such as used in hospitals or small commercial establishments.

In the interests of safety, it is also highly desirable to provide an incinerator construction wherein the outer wall surfaces, including the charging door, are maintained at low temperature levels while the appliance is being used.

It has been common practice to provide seals around the edge of doors to prevent leakage of smoke under normal conditions of use. However, it has been difficult to provide smoke-preventing seals in appliances where relatively high temperatures are encountered during a burning cycle. High temperature materials of conventional economically purchased materials usually do not provide efficient sealing capabilities, while readily available low temperature materials such as rubber, for example, have limited temperature capabilities.

Natural convection cooling of a door or wall is inadequate and, since come type of forced air cooling is required, the seal also should be such as will be compatible with forced air circulation.

SUMMARY OF THE INVENTION

The above and other objections to known burning appliances are overcome by the present invention wherein the interior burning compartment is enclosed within a double-walled jacket including a double-walled hinged door through which access is had to the compartment. Cool air is directed under pressure through the space between the walls of the jacket and also through the space between the walls of the door. This has been found to maintain the outer surfaces of the walls and door at a safely low temperature.

An outer seal between the edge of the door and its encircling frame in the wall of the jacket is adequately and conveniently of a low temperature material such as rubber, and prevents the forced cooling air from escaping. A second inner peripheral seal is located between the door and frame inwardly of the first seal and comprises a high temperature material such as fiber glass braid with a stainless steel mesh core. Such a high temperature material is somewhat porous, however, and normally smoke from the burning compartment would seep through into the space between the door and frame since combustion air and gases within the compartment are maintained at pressures higher than normal ambient air pressures.

Therefore, in further accordance with this invention, means is provided for introducing the forced cooling air into the space between the door seals as it flows through the jacket and door walls, with such forced air flow being at a pressure slightly greater than the pressure within the burning compartment. For example, with a pressure of about **0.15–0.25** iwc within the compartment, and with cooling air being circulated at a pressure of about **0.3** iwc, it will be apparent that a small amount of the circulating cooling air will percolate through the inner high temperature seal into the

burning compartment. No air will travel in the reverse direction through the inner seal and thus no smoke will escape through the door.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other objectives and advantages of this invention will become apparent from the following description taken in connection with the accompanying drawings, wherein

FIG. **1** is an isometric view of an incinerator embodying the invention;

FIG. **2** is a vertical sectional view taken substantially on line **2—2** of FIG. **1** looking in the direction of the arrows;

FIG. **3** is a horizontal sectional view taken substantially on line **3—3** looking in the direction of the arrows;

FIG. **4** is a fragmentary enlarged vertical sectional view taken through the incinerator door and adjacent portions of the incinerator jacket; and

FIG. **5** is an enlarged isometric view illustrating particularly the inner side of the incinerator door.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring more particularly to the drawings wherein like characters of reference designate like parts throughout the several views, the invention is shown as applied to a household incinerator **10.** However, it is to be understood that the invention may be utilized with other types of apparatus such as ovens, furnaces, heaters, or the like in which it is desired that outer surfaces be kept at safely low temperatures and that no smoke, gases or noxious products be allowed to escape around the edge of the door. While the invention is shown as applied to a household incinerator, details of the construction and operation of the incinerator such as are not believed to constitute part of the present invention will not be discussed herein but may be found in U.S. Pat. No. **3,776,148** issued on Dec. **4, 1973** to the same inventors as the present invention.

The incinerator **10** is shown as including a burning compartment **12** which is defined by an enclosing jacket having an inner rear wall **14,** inner front wall **16,** inner side walls **18** and **20,** and inner top and bottom walls **22** and **24** respectively. Walls **14–24** are spaced from respective outer walls **26–28–30–32–34–36** to form an air circulation space within the walls completely around the appliance.

The inner structure may comprise a single burning compartment as shown or may be separated into multiple chambers such as combustion chamber, afterburner and flue, for example. While the inner walls are depicted in the drawings as comprising a single layer, it is to be understood that these inner walls will usually consist of several layers including an insulating fire resistant inner layer and an enclosing metal skin, with or without additional heat insulation. This inner structure is mounted as by a number of legs **38** so as to retain the spaced relation to the outer wall structure and thereby maintain the air circulation space therebetween.

A hinged door **40,** to be described, is mounted at the front of the appliance to provide access means whereby a charge to be burned may be put into the burning compartment. As shown in FIG. **1,** a storage area may be provided in the form of a slidable drawer **42,** and a sec-

ond smaller drawer **44** may be provided for ash removal or other purposes as desired.

Upon one side wall **32** is conveniently mounted a housing **46** (FIG. **3**) which encloses the drawers **42** and **44** at its forward end, and which encloses a volute **48** having a conventional motor and fan which thus forms an air circulating blower or pump **50**. An input orifice **52** is provided in wall **32** to allow air to enter the blower **50** and a second orifice **54** allows air to be forced by the pump into the air circulation space **66** between the inner and outer walls of the jacket.

A gas or oil-fueled burner **56** of any conventional or known type is provided at a suitable location to provide incineration of a charge in the burning compartment. The burner **56** may be ignited in any suitable manner and may be cyclically or otherwise controlled such as taught, for example, in aforementioned U.S. Pat. No. **3,776,148.**

Input of cooling air is achieved through an external vent terminal box **58** which is mounted on the rear wall **26** by an outer pipe **60** which coaxially encircles an exhaust pipe **62,** pipe **62** permitting exhaust of air from within the space **64** between the jacket rear walls. Input of cool air is achieved through apertures **64** in a portion of the terminal box nearest the wall **26,** which air travels into the circulation space **64** between walls **14** and **26** as indicated by arrows in FIGS. **2** and **3.** This cool air is drawn into the blower **50** through port **52** and is then forcibly expelled through port **54** into space **66** between side walls **20** and **32,** from which it passes into the door area.

The door **40** comprises a closed hollow front panel **68** which includes spaced front and rear walls **70** and **72** respectively. A central rear portion **74** of the door projects rearwardly into the interior of the burning compartment and comprises a boxlike member of high temperature material such as stainless steel, for example, which is filled with insulating material **76** such as ceramic fiber, for example.

The inner and outer front walls **16** and **28** of the jacket are shaped to provide an opening to receive the door **40** as clearly shown in FIGS. **2** and **4** and the peripheral edge of this opening is sealed by an angled frame **78** within which the door **40** resides when in closed position, as illustrated. At the bottom the door is hinged in any suitable manner, such as by hinge members **80** fixed to the door at their upper ends and pivotally secured at their lower ends to a bracket **82** carried by one of the front walls **16** or **18.**

Frame **78** includes an angled portion **84** which extends around the opening so as to overlie the inner or rear wall **72** of the door and has an inwardly directed peripheral flange **86** to define a smaller opening within which the projecting portion **74** of the door resides when the door is closed.

Portion **84** of the frame is provided with a number of vertically arranged vents or ports **88** (FIGS. **3** and **5**) on either side of the door, and the rear wall **72** of the door has similar cooperating vents or ports **90.** Thus, cool air is enabled to flow from space **66,** through vents **88** and **90** in the adjacent side of the frame and door into the interior of the door panel **60** to cool the front of the door. From the interior of the door panel the air then flows out through the vents and ports in the opposite side of the door and frame into the space **92** between sidewalls **18** and **30** of the jacket. From space **92,** this air then passes into space **94** between the rear walls **14** and **26** of the jacket and exits into exhaust pipe **62.** From the end of the exhaust pipe **62** this air is directed upwardly and out through vents in the top of the terminal box **58.**

Incidentally, hot air and gases from within the burning compartment also exits by means of a short exhaust pipe **96** directly into exhaust pipe **62.**

It will be apparent that some substantial amount of the circulating cool air flowing from the jacket through the door normally would tend to escape out around the edge of the door between the door and frame. This is prevented in the present invention by the provision of an O-ring type outer seal **98.** Outer seal **98** is fixed the door's inner wall **72** around the peripheral edge thereof and is adapted to be compressed between the wall **72** and adjacent frame **78** when the door is closed. Being located in a relatively cool region, the outer seal **98** is a low temperature material such as rubber, plastic or the like having efficient air-sealing characteristics.

An inner seal **100** is mounted on the door inner wall **72** encircling and adjacent the projecting portion **74** thereof. This region where the inner seal **100** is located becomes relatively hot and, therefore, rubber or other low temperature material will rapidly deteriorate when the incinerator is used. This problem is overcome by employing a high temperature material such as fiber glass braid for the inner seal. Such material is slightly porous, but it will resist the high temperatures to which the inner seal **100** is subjected.

In order to prevent leakage of hot air and gases out of the burning compartment through inner seal **100** into the space around the edge of the door, the air circulating through the door and jacket is at a pressure slightly greater than the pressure within the burning compartment. For example, if the pressure within the burning compartment is about **0.15–0.25** iwc, for example, the pressure of the circulating cool air may conveniently and satisfactorily be about **0.3** iwc. In such a case, there will be slight percolation of the cool circulating air through the inner seal **100** into the burning compartment. Such percolation is very small, depending upon the porosity of the material of the inner seal **100,** and will not adversely effect the operation of the apparatus.

Actual pressures within the burning compartment will result from the inherent combustion process which is supplied with air for combustion purposes from the blower **50,** such as via a pipe **104** leading from the blower into the burning compartment, or elsewhere, as is well known. Control of the air pressure within the walls of the jacket and door is achieved in many ways, such as by control of the size of an outlet aperture **102** (FIG. **2**) adjacent the exhaust pipe **62.**

From the foregoing it will be apparent that all of the objectives and advantages of this invention have been achieved by the novel apparatus shown and described. It will also be apparent, however, that various modifications and changes in the structures shown and described may be made by those skilled in the art without departing from the spirit of the invention as expressed in the accompanying claims. Accordingly, all matter shown and described is to be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. An appliance comprising a burning compartment surrounded by a jacket, said jacket having air circulation passages therein, a door in said jacket communi-

cating with the interior of the burning compartment, said door having an air circulation passage therein, port means cooperatively interconnecting the air circulation passages in the door and jacket, means for circulating air within the interior of the burning compartment at a known pressure, and means for circulating cooling air through said air circulation passages in the door and jacket at a pressure slightly greater than the pressure of the air within the burning compartment.

2. An appliance comprising a burning compartment surrounded by an enclosure, an opening in said enclosure, a frame supported in said enclosure and outlining said opening, a door removably positioned in said frame in closing relation to said opening, and sealing means between said door and frame, said sealing means comprising a pair of spaced resilient O-ring members, one of said sealing members being located inwardly of the other and effectively nearer the burning compartment, the outer of said sealing members being substantially resistant to passage of air therethrough, and the inner sealing member being porous.

3. An appliance as set forth in claim **2** wherein the outer of said sealing members is rubber or plastic, and the inner sealing member is fiber glass braid.

4. An appliance comprising a burning compartment surrounded by an enclosure, said enclosure comprising walls having air circulation passages therein, an opening in said enclosure for communication with the interior of said burning compartment, a frame supported by said enclosure and outlining said opening, a door removably positioned in closing relation to said opening, said door comprises a front panel and a rear panel and having an air circulation passage disposed between said panels, said rear panel extends across said opening, said frame has a substantially planar portion extending around said opening in overlying and substantially parallel relation to said rear panel, sealing means between said door and said frame comprising a pair of spaced resilient O-ring members, one of said sealing members is located inwardly of the other and effectively nearer the burning compartment, the outer sealing member is substantially resistant to passage of air therethrough, said inner sealing member is porous, port means cooperatively interconnecting the air circulation passages in the door and enclosure walls via the space between said members, and means for circulating cooling air through said air circulation passages in the door and walls.

5. An appliance as set forth in claim **4** wherein said air circulating means includes means for also directing air into the interior of the burning compartment at a known pressure, and means for directing said cooling air through said walls and door at a pressure slightly greater than the pressure within the burning compartment.

6. An appliance comprising a burning compartment surrounded by an enclosure, said enclosure having spaced inner and outer walls defining an air passage therebetween, an opening in said enclosure communicating with the interior of the burning compartment, a door removably positioned in closing relation to said opening, said door comprising front and rear panels defining an air passage therebetween, ports cooperatively interconnecting the air passages in the walls and door, means for circulating air through said burning compartment at a known pressure, and means for circulating cooling air through said wall and door passages via said ports at a pressure slightly greater than the pressure of the air within the burning compartment.

7. An appliance as set forth in claim **6** wherein a pair of spaced inner and outer O-ring seals are disposed between the door and surrounding wall of the enclosure, and said inner seal is porous whereby some of the air flowing from said passage in the wall toward said passage in the door will percolate into the burning compartment.

8. An appliance as set forth in claim **1** wherein sealing means is provided between said door and jacket comprising an outer substantially nonporous member, and an inner member which is porous to the higher pressure air within the jacket and door.

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